ABSTRACT

A procedure generates deconvolution algorithms by first solving a general convolution integral exactly. Results are transformed, yielding a linear relationship between actual (undistorted) and captured (distorted) data. Hermite functions and the Fourier-Hermite series represent the two data classes. It circumvents the need for solving incompatible systems of linear equations derived from "numerically discretizing" convolution integrals, i.e., the convolution integral is not evaluated. It is executed by exploiting a mathematical coincidence that the most common Point Spread Function (PSF) used to characterize a device is a Gaussian function that is also a Fourier-Hermite function of zero order. By expanding the undistorted data in a Fourier-Hermite series, the convolution integral becomes analytically integrable. It also avoids an inherent problem of dividing by decimal "noisy data" values in conventional "combined deconvolution" in that division is by a function of the PSF parameters yielding divisors generally greater than one.